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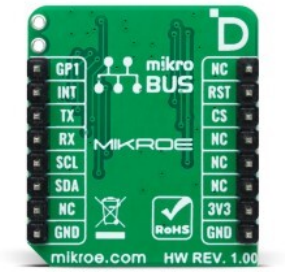
Air Quality 12 Click



PID: MIKROE-6418

Air Quality 12 Click is a compact add-on board for monitoring indoor air quality. This board features the RRH46410, a digital gas sensor module from Renesas, which integrates advanced sensing technology for precise detection of total volatile organic compounds (TVOC), indoor air quality (IAQ), and estimated carbon dioxide levels (eCO2). This module features a MEMS gas sensing element with a metal oxide (MOx) chemiresistor, a CMOS signal conditioning IC, and an onboard MCU, offering a complete, self-contained solution with low power consumption and support for both UART and I2C communication. Its AI-enhanced design ensures accurate measurements with fast response times, even without direct airflow, making it ideal for detecting hazardous materials and harmful fumes. Air Quality 12 Click is ideally suited for applications such as indoor air quality monitoring in homes, offices, and public buildings, as well as automation in air purifiers, HVAC systems, and other air quality-based devices.

How does it work?

Air Quality 12 Click is based on the RRH46410, a digital gas sensor module from Renesas designed for monitoring indoor air quality. This module integrates advanced sensing technology to detect and measure total volatile organic compounds (TVOC), indoor air quality (IAQ), and estimated carbon dioxide levels (eCO2) with precision and reliability. Tailored for indoor air monitoring applications, this sensor module combines a MEMS gas sensing element, a CMOS signal conditioning IC, and an onboard microcontroller, offering a complete, self-contained gas detection solution. Thanks to its low operating power consumption and multiple operational methods, this solution is ideally suited for applications such as indoor air quality monitoring, ensuring healthy environments in homes, offices, and public buildings, and detection of hazardous materials and harmful fumes, including those from construction materials, and automation of air quality-based devices.

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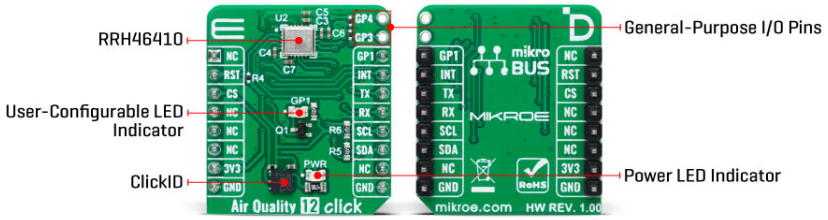

The RRH46410's MEMS gas sensing element incorporates a heater on a silicon-based structure and a metal oxide (MOx) chemiresistor, capable of detecting changes in conductivity caused by gas concentrations. The module's signal conditioner regulates the sensor temperature and processes MOx conductivity measurements, while the integrated microcontroller generates a calibrated digital output, eliminating the need for complex data processing on the user's host MCU.

The RRH46410 stands out for its intelligent design, leveraging artificial intelligence (AI) and a machine-learning algorithm to produce accurate air quality measurements. It can detect TVOC contaminants based on established international indoor air quality standards while responding effectively, though not selectively, to hydrogen (H_2) within the parts-per-million range. Its fast response time, measured in seconds, ensures near-instantaneous readings without requiring direct airflow onto the sensor. However, while it can detect gases like carbon monoxide (CO), it is not approved for safety-critical applications and should not be relied upon for life-saving use cases.

This Click board™ supports both UART and I2C interfaces for communication with the host MCU. The UART interface operates at a default baud rate of 115200bps, enabling efficient data transmission and exchange, while the I2C interface supports clock frequencies of up to 400kHz for flexible integration with various systems. In addition to the interface pins, the board includes other control pins such as the RST pin for resetting the module, the INT pin for real-time alerts (set HIGH when data is available and LOW after data is read), and the GP1 pin, which controls the red GP1 LED. This user-configurable LED serves as a visual indicator for various scenarios based on the user's needs. The board also features two unpopulated pins labeled GP3 and GP4, which are general-purpose I/O pins configured as always-inputs and lacking internal pull-ups, providing additional versatility for custom applications.

This Click board™ can be operated only with a 3.3V logic voltage level. The board must perform appropriate logic voltage level conversion before using MCUs with different logic levels. It also comes equipped with a library containing functions and example code that can be used as a reference for further development.

Specifications

Type	Environmental
Applications	Ideally suited for applications such as indoor air quality monitoring in homes, offices, and

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	public buildings, as well as automation in air purifiers, HVAC systems, and other air quality-based devices
On-board modules	RRH46410 - digital gas sensor module for indoor air quality applications from Renesas
Key Features	Measures total volatile organic compounds (TVOC), indoor air quality (IAQ), and estimated carbon dioxide levels (eCO2), based on MEMS gas sensing element with a metal oxide (MOx) chemiresistor for high precision, built-in MCU, machine-learning algorithm for accurate air quality measurement and real-time response, UART and I2C interfaces, user-configurable LED indicator, and more
Interface	I2C,UART
Feature	ClickID
Compatibility	mikroBUS™
Click board size	S (28.6 x 25.4 mm)
Input Voltage	3.3V

Pinout diagram

This table shows how the pinout on Air Quality 12 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS				Pin	Notes
	NC	1	AN	PWM	16	**GP1**	LED Indicator Control
Reset	**RST**	2	RST	INT	15	**INT**	Interrupt
ID COMM	**CS**	3	CS	RX	14	**TX**	UART TX
	NC	4	SCK	TX	13	**RX**	UART RX
	NC	5	MISO	SCL	12	**SCL**	I2C Clock
	NC	6	MOSI	SDA	11	**SDA**	I2C Data
Power Supply	**3.3V**	7	3.3V	5V	10	NC	
Ground	**GND**	8	GND	GND	9	**GND**	Ground

Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator
LD2	GP1	-	User-Configurable LED Indicator

Air Quality 12 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage	-	3.3	-	V
TVOC Measurement Range	1	-	2000	µg/m3
TVOC Accuracy	-	±20	-	µg/m3
TVOC Resolution	-	1	-	µg/m3

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IAQ and TVOC Measurement Range	160	-	10.000	ppb

Software Support

We provide a library for the Air Quality 12 Click as well as a demo application (example), developed using MIKROE compilers. The demo can run on all the main MIKROE development boards.

Package can be downloaded/installed directly from NECTO Studio Package Manager (recommended), downloaded from our LibStock™ or found on MIKROE github account.

Library Description

This library contains API for Air Quality 12 Click driver.

Key functions

- airquality12_get_sensor_info This function reads the device product ID, firmware version, and tracking number.
- airquality12_get_int_pin This function returns the INT pin logic state.
- airquality12_get_measurement This function reads the sensor measurement results.

Example Description

This example demonstrates the use of Air Quality 12 Click by reading the IAQ 2nd Gen measurements and displays the results on the USB UART.

The full application code, and ready to use projects can be installed directly from NECTO Studio Package Manager (recommended), downloaded from our LibStock™ or found on MIKROE github account.

Other MIKROE Libraries used in the example:

- MikroSDK.Board
- MikroSDK.Log
- Click.AirQuality12

Additional notes and informations

Depending on the development board you are using, you may need USB UART click, USB UART 2 Click or RS232 Click to connect to your PC, for development systems with no UART to USB interface available on the board. UART terminal is available in all MIKROE compilers.

mikroSDK

This Click board™ is supported with mikroSDK - MIKROE Software Development Kit. To ensure proper operation of mikroSDK compliant Click board™ demo applications, mikroSDK should be downloaded from the LibStock and installed for the compiler you are using.

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For more information about mikroSDK, visit the official page.

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